

Comparative Study of Coronary Angiography in Diabetic and Non-Diabetic Patients at the Le Luxembourg Mother and Child Hospital of Bamako

Massama Konate^{1,2}, Mamadou Toure^{2,3}, Mariam I. Sako^{2,4}, Djenebou Traore^{2,4}, Souleymane Mariko⁵, Samba Sidibe^{2,4}, Souleymane Coulibaly^{2,4}, Ichaka Menta^{2,3}

¹Hospital of Mali, Bamako, Mali

²University of Bamako USTTB, Bamako, Mali

³Teaching Hospital Center Gabriel Toure, Bamako, Mali

⁴Teaching Hospital Center Point G, Bamako, Mali

⁵Hospital of Tombouctou, Tombouctou, Mali

Email: massamakonate@gmail.com

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Abstract

Introduction: Diabetes is a major cardiovascular risk factor, increasing the likelihood of developing ischemic heart disease. It is on the rise in Africa. **Objective:** We compared the socio-demographic, clinical and coronary angiography characteristics of diabetic patients with those of non-diabetic patients. **Patients and methods:** A case-control study over a three-years period from September 2019 to August 2022. All patients who underwent coronary angiography in the interventional cardiology unit of the teaching hospital “Mère-Enfant Le Luxembourg” of Bamako, Mali, were included. We compared patient coronary angiogram aspects of diabetic patients with non-diabetic patients. **Results:** We compiled 303 records of diabetic patients, which were compared with 507 records of non-diabetic patients. The mean age of diabetic patients was 61.20 ± 10.11 years, higher than that of non-diabetic patients (57.84 ± 12.88 years), with a statistically significant difference ($p < 0.05$). The male-to-female ratio was 1.56 for diabetic patients and 3.12 for non-diabetic patients. Hypertension was significantly more prevalent among diabetics (75.2%) compared to non-diabetics (55.2%) ($p < 0.05$). Smoking was significantly more prevalent among non-diabetics (31.6%) compared to diabetics (19.47%) ($p < 0.05$). Angina was more common among diabetics (37%) compared to non-diabetics (25.24%), with a significant difference ($p < 0.05$). Atypical chest pain was present in both

groups, with no significant difference. Indication for coronary angiography in diabetic patients was ACS (37.6%). This indication was significantly more common in diabetic patients than in non-diabetic patients ($p < 0.05$). Three-vessel disease was more common in diabetic patients (34.32%) than in non-diabetic patients (18.50%), with a significant difference ($p < 0.05$). **Conclusion:** Coronary lesions are present in diabetic patients, with a predominance of three-vessel disease compared to non-diabetic patients.

Keywords

Diabetes, Coronary Angiography, Teaching Hospital “Mère-Enfant Le Luxembourg”, Bamako

1. Introduction

Cardiovascular diseases are a leading cause of comorbidity and death among people with type 2 diabetes with coronary artery disease having the highest prevalence [1] [2]. Diabetes is a major cardiovascular risk factor; it contributes to the development of degenerative complications such as microangiopathies [3]. Ischemic heart disease is one of the main macroangiopathies associated with diabetes. The risks of cardiovascular events or death are 2 to 4 times great with patients with type 2 diabetes than in the general population [4]. Haffner *et al.* publish that risk for major coronary events in patients with diabetes is similar to that of nondiabetic patients with established coronary artery disease [5].

Diabetes is a well-established risk factor for ischemic heart disease, and coronary artery disease accounts for 40% - 80% of deaths in patients with diabetes [6]. Diabetes has become a pandemic, with a particularly significant rise in Africa [1]. This will lead to an increase in cases of ischemic heart disease among diabetic patients in Africa.

Diagnosing this ischemic heart disease can sometimes be difficult in people with diabetes due to neuropathy. Studies show that clinical symptoms of coronary artery disease in patients with diabetes are often less severe and present in an atypical manner [6]. Hence, there is the need to carry out cardiovascular investigations in order to diagnose it. One of the best diagnostic methods is coronary angiography. This procedure is becoming increasingly accessible in Africa as the number of countries where it is performed grows. Studies conducted in Senegal and Ivory Coast have demonstrated more severe coronary lesions in people with diabetes compared to those without diabetes [7] [8].

There is limited data in Africa on the coronary angiographic findings of diabetic patients compared with those of non-diabetic patients.

This prompted us to carry out this study, the aim of which was to compare the sociodemographic, clinical and coronary angiographic characteristics of diabetic and non-diabetic patients.

2. Patients and Methods

We conducted a case-control study over a three-years period from September 2019 to August 2022 in the interventional cardiology unit of the cardiology department at the teaching hospital “Mère-Enfant Le Luxembourg”.

We included all diabetic type 1 and type 2 and non-diabetic patients who underwent coronary angiography. Diabetes was defined as a fasting blood glucose level of ≥ 1.26 g/l or a blood glucose level of ≥ 2 g/l 120 minutes after an oral glucose tolerance test, or as known diabetic patients on treatment with well-controlled blood glucose levels. Angina and atypical chest pain were defined by criteria of European Society of Cardiology (ESC) 2023 [9]. Acute coronary syndrome (ACS) with or without ST segment elevation were identify upon ESC guidelines 2024 [10]. Patients were enrolled consecutively.

Data were collected from patient’s medical records. Individual records were completed. These contained clinical data (age, sex, functional symptoms and cardiovascular risk factors), paraclinical data (electrocardiographic changes, anatomical features of coronary lesions) and indications for coronary angiography.

Data were entered using Microsoft Word and analyzed with SPSS version 23. Categorical variables (e.g., sex, prevalence of hypertension, smoking, and angiographic findings) were compared using the Pearson chi-square test or Fisher’s exact test where appropriate. Continuous variables (e.g., mean age) were expressed as mean \pm standard deviation and compared using the independent Student’s t-test. For the primary angiographic outcomes, Odds Ratios (OR) with 95% Confidence Intervals (CI) were calculated to measure effect size. Missing data were managed through pairwise deletion, ensuring that all available data for each specific variable were included in the comparisons. A p-value < 0.05 was considered statistically significant.

3. Results

During the study period, 810 coronary angiography were performed, of which 303 were carried out on diabetic patients (37.40%) and 507 on non-diabetic patients. These two groups were compared. The mean age of diabetic patients was 61.20 ± 10.11 years, higher than that of non-diabetic patients (57.84 ± 12.88 years), with a statistically significant difference ($p < 0.05$). The male-to-female ratio was 1.56 for diabetic patients and 3.12 for non-diabetic patients.

The main cardiovascular risk factor associated with diabetes was hypertension, which was significantly more prevalent among people with diabetes (75.2%) than among those without diabetes (55.2%) ($p < 0.05$) (Table 1). Smoking was significantly more prevalent among non-diabetics (31.6%) compared to diabetics (19.47%) ($p < 0.05$).

Angina was more prevalent among diabetics (37%) compared to non-diabetics (25.24%), with a significant difference ($p < 0.05$). Atypical chest pain was present in both groups without a significant difference.

Coronary angiography was indicated in diabetic patients presenting with ACS

in 37.6% of cases, compared with 26.6% in non-diabetic patients. This indication was significantly more common in diabetic patients than in non-diabetic patients ($p < 0.05$) (**Table 2**).

Coronary angiography was abnormal in 78.5% of diabetic patients ($n = 238$) versus 58% of non-diabetic patients ($n = 294$), $p < 0.05$. Involvement of the left main coronary artery was present in 4% of diabetics ($n = 12$) versus 1.2% of non-diabetics ($n = 6$) ($p < 0.05$).

Three-vessel disease was more common in diabetics (34.32%) than in non-diabetics (18.50%), with a significant difference ($p < 0.05$) (**Table 3**).

Diabetic patients had a significantly higher risk of abnormal findings at coronary angiography compared to non-diabetics (OR: 2.65; 95% CI: 1.91 - 3.68; $p < 0.001$).

Three-Vessel (Tritroncular) Disease was significantly more frequent in diabetics (OR: 2.31; 95% CI: 1.66 - 3.22; $p < 0.001$).

Diabetics showed a higher prevalence of left main disease (OR: 3.44; 95% CI: 1.28 - 9.25; $p = 0.006$).

Table 1. Clinical data.

Clinical data	Diabetics n = 303	Non diabetics n = 507	p
Age	61.20 +/- 10.11 years	57.84 +/- 12.88 years	<0.05
Sex-ratio M/F	1.56	3.12	<0.05
Hypertension	75.2% (n = 228)	55.2% (n = 280)	<0.001
Dyslipidaemia	6.9% (n = 21)	6.3% (n = 32)	0.36
Smoking	19.5% (n = 59)	31.8% (n = 161)	<0.001
Obesity	9.2% (n = 28)	5.9% (n = 30)	0.04
Sedentary lifestyle	47.5% (n = 144)	40.2% (n = 204)	0.02
History of coronary heart disease	9.2% (n = 28)	3.7% (n = 19)	<0.001
Angina	37% (n = 112)	25.2% (n = 128)	<0.001
Atypical Chest Pain	30.3% (n = 92)	31.2% (n = 158)	0.4
Shortness of breath	9.5% (n = 29)	12.4% (n = 63)	0.1
Asymptomatic	9.5% (n = 29)	8.9% (n = 45)	0.36

Table 2. Indications for coronary angiography.

Indications	Diabetics	Non diabetics	p
ACS	37.6% (n = 114)	26.6% (n = 135)	<0.001
ACS ST+	26.7% (n = 81)	19.5% (n = 99)	0.009
ACS ST-	11.6% (n = 35)	7.1% (n = 36)	0.01
CCS	53.5% (n = 162)	52.3% (n = 265)	0.37
Dilated cardiomyopathy	8.9% (n = 27)	19.3% (n = 98)	<0.001
Pre-operative assessment	-	1.7% (n = 9)	

Table 3. Coronary angiography results.

Results	Diabetics (n = 303)	Non-diabetics (n = 507)	Odds Ratio (95% CI)	p-value
Abnormal Angiography	78.5% (n = 238)	58% (n = 294)	2.65 (1.91 - 3.68)	<0.001
Monotroncular	21.5% (n = 65)	21.9% (n = 111)	0.97 (0.69 - 1.38)	0.4
Bitroncular	22.4% (n = 68)	17.6% (n = 89)	1.35 (0.95 - 1.93)	0.04
Tritroncular	34.3% (n = 104)	18.5% (n = 94)	2.31 (1.66 - 3.22)	<0.001
Multitroncular	56.7% (n = 172)	36.1% (n = 183)	2.32 (1.73 - 3.11)	<0.001
Left Main	4% (n = 12)	1.2% (n = 6)	3.44 (1.28 - 9.25)	0.006

4. Discussion

Diabetes is on the rise in developing countries, particularly in Mali. The proportion of diabetes in our study of patients who underwent coronary angiogram was 37.40%. This proportion was higher than that reported by N'Guetta *et al.* in Abidjan [8]. These findings highlight the significant proportion of diabetic patients in cardiology settings.

The mean age of diabetic patients was 61.20 ± 10.11 years, higher than that of non-diabetic patients (57.84 ± 12.88 years), with a statistically significant difference ($p < 0.05$). This result is consistent with that of N'Guetta in Abidjan, who found the mean age of diabetic patients to be 58.7 years, higher than the mean age of non-diabetic patients, which was 52.1 years, with a significant difference ($p < 0.001$) [8].

In the study by Dioum *et al.* in Dakar, the mean age of people with diabetes was 62.26 years, compared with a mean age of 59.06 years for those without diabetes; however, this difference was not statistically significant ($p = 0.6$) [7]. Outside Africa, in Bangladesh, Parvin *et al.* also found a higher mean age among patients with diabetes in their study [11].

In our study, men were in the majority, with a male-to-female ratio of 1.56 among diabetics and 3.12 among non-diabetics. This finding is consistent with the study by N'Guetta *et al.* in Abidjan, which reported 87.5% men among diabetics and 86.1% men among non-diabetics; however, the difference was not statistically significant ($p = 0.74$) [8]. In Dakar, Dioum *et al.* observed a male predominance in their series, with a sex ratio of 1.6 in both groups [7]. In Bangladesh, Parvin *et al.* observed a male predominance in both groups [11]. This demonstrates that ischemic heart disease is more common in men, whether they are diabetic or not.

The main cardiovascular risk factor associated with diabetes was hypertension in both groups, affecting 75.2% of diabetics and 55.2% of non-diabetics. The difference was statistically significant ($p < 0.05$). The same finding was reported by N'Guetta in Abidjan and Parvin in Bangladesh in their studies, with a high prevalence of hypertension in both groups [8] [11]. In Europe, the ESC/EURObserva-

tional Research Programme (EORP) EUROASPIRE surveys found that history of hypertension was present in 74% of men and 81% of women with newly diagnosed diabetes with a history of coronary heart disease [12]. Hypertension is common among people with type 2 diabetes. Hypertension is a major risk factor for coronary artery disease [13]. This association rise the risk of coronary artery disease.

Smoking was significantly more prevalent among non-diabetics (31.6%) compared to diabetics (19.47%) ($p < 0.05$). N'Guetta and Parvin had also observed a higher prevalence of smokers among non-diabetics [8] [11].

Clinically, in our study, angina was more prevalent among diabetics (37%) than among non-diabetics (25.24%), with a statistically significant difference ($p < 0.05$). Atypical chest pain was present in both groups, with no statistically significant difference. Dioum in Dakar found a prevalence of typical pain of 8.9% among diabetics versus 68.9% among non-diabetics [7].

Coronary angiography was indicated in the majority of cases presenting with chronic coronary syndrome (CCS) in our series, in contrast to the study by N'Guetta *et al.*, who performed coronary angiography in the majority of cases presenting with acute coronary syndrome (ACS) regardless of the group [8]. Parvin also performed coronary angiography in 52% of cases with ACS, with a predominance of CCS indications in diabetic patients and ACS in non-diabetic patients [11]. In our series, it was performed in diabetic patients with ACS in 37.6% of cases. This indication was significantly more common in diabetic patients compared with non-diabetic patients ($p < 0.05$).

In United States of America, Aggarwal found that among patients presenting with ST-elevation myocardial infarction, 25% have a history of diabetes and more than 40% show a previously undiagnosed T2DM or pre-diabetes [14].

Coronary angiography revealed three-vessel disease in 34.32% of diabetic patients, with multi-vessel disease present in 56.7% of diabetic patients in our study. Multivessel disease was also predominant among diabetics in N'Guetta's series, with 13.7% of cases showing three-vessel disease and 43.8% showing multivessel disease [8]. Dioum in Dakar found 26.7% of tritroncular lesions in diabetics compared with 16.6% in non-diabetics [7]. Parvin in Bangladesh found a higher incidence of left main disease and three-vessel disease among diabetics [11]. These data reinforce the major place of diabetes in the development of severe coronary artery disease, regardless of continent or country.

We observed significant baseline differences between the two groups; specifically, diabetic patients were older and had a higher prevalence of hypertension, while non-diabetics were more likely to be smokers. The current results represent unadjusted group comparisons. While these findings clearly demonstrate a higher burden of multivessel disease in diabetic patients in our clinical setting, future studies with larger cohorts should utilize multivariate logistic regression to adjust for these confounding variables (age, smoking, and hypertension) to isolate the independent impact of diabetes on coronary anatomy.

5. Conclusion

Diabetes is a major cardiovascular risk factor. Hypertension is the main risk factor associated with diabetes. Smoking is more common among non-diabetics requiring coronary angiography. Coronary artery disease is more common among diabetics, with lesions primarily affecting multiple branches compared with non diabetics. The management of this coronary artery disease involves controlling cardiovascular risk factors and improving access to healthcare, particularly in developing countries, notably in Africa.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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